



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 8**

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Ref: 8EPR-N

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Gwyn M. Jarrett, Project Manager  
Department of the Army  
Corps of Engineers, Omaha District  
CENWO-PM-AA  
Attn: Chatfield Reservoir Storage Reallocation FR/EIS  
1616 Capital Avenue  
Omaha, Nebraska 68102-4901

Re: EPA Comments on the  
Chatfield Reservoir Storage Reallocation  
Draft Integrated Feasibility Report and  
Environmental Impact Statement  
CEQ # 20120191

Dear Ms. Jarrett:

The U.S. Environmental Protection Agency Region 8 (EPA) has reviewed the U.S. Corps of Engineers (Corps) Draft Integrated Feasibility Report and Environmental Impact Statement (DEIS) for the Chatfield Reservoir Storage Reallocation project. Our review was conducted in accordance with EPA's responsibilities under section 102 of the National Environmental Policy Act (NEPA), 42 U.S.C. § 4332(2)(c), and Section 309 of the Clean Air Act, 42 U.S.C. § 7609. Section 309 of the Clean Air Act directs EPA to review and comment in writing on the environmental impacts of any major federal agency action. EPA's comments include a rating of the environmental impact of the proposed action and the adequacy of the NEPA document.

### **Background**

The purpose of the Chatfield Reservoir Storage Reallocation project is to sustainably increase availability of water in the greater Denver area so that a larger proportion of existing and future water needs can be met while lessening the dependence on non-tributary groundwater. The Colorado Water Conservation Board (CWCB), on behalf of a group of 15 water providers and other water rights holders (Providers) in the Denver metropolitan area, has proposed reallocating space within Chatfield Reservoir for water supply. Chatfield Reservoir is located southwest of Denver in Chatfield State Park, at the confluence of the South Platte River and Plum Creek within the South Platte River Basin.

The DEIS evaluates four alternatives including the No Action alternative (Alternative 1). Alternative 1 assumes that the water providers would use a newly constructed Penley Reservoir and gravel pit storage to meet future water storage needs. Alternative 2 utilizes non-tributary groundwater (NTGW) for use by upstream water providers combined with gravel pit storage for downstream providers. Alternative 3 and Alternative 4 propose reallocating storage from flood control to primarily municipal and industrial

(M&I) water supply. Alternative 3 is the proposed project and the Corps' Preferred Alternative. This alternative would allow an additional 20,600 acre-feet of water supply storage and raise the base elevation of the flood control pool in the reservoir from 5,432 to 5,444 feet above mean sea level (msl). Alternative 4 would allow an additional 7,700 acre-feet of water supply storage and raise the base elevation of the flood control pool to 5,437 feet msl. Additional water supply sources of NTGW and downstream gravel pit storage are also included in Alternative 4 to supply an additional 839 acre-feet.

The Preferred Alternative involves reallocating existing flood control storage and re-designating it to joint flood control and conservation for water supply, thus increasing the volume of available water from Plum Creek and the South Platte River and decreasing dependence on groundwater sources. Water level fluctuations could increase both in magnitude and frequency (pool elevations could fluctuate up to 21 feet based on historic low elevation and maximum elevation of the Preferred Alternative). The operation of the reservoir and the resulting water levels are dependent upon numerous factors, including flow conditions upstream and downstream, the priority of water rights of downstream water providers, requests for release of stored water, precipitation and evaporation. The DEIS acknowledges that water level fluctuations and other changes to the operation of the reservoir under the Preferred Alternative will cause environmental impacts, and may impact existing recreational uses provided by the reservoir and the adjacent lands.

## **EPA Comments**

The EPA appreciates that the Corps, the Providers and the CWCB have included the EPA in their project discussions during the planning process. The DEIS reflects the substantial research and analyses that have been conducted to identify impacts and provide a plan to reduce undesirable effects. After review of the DEIS and its analysis of the Preferred Alternative, the EPA has the following principal concerns: 1) potential water quality impacts to Chatfield Reservoir and the South Platte River; 2) use of water quality data and modeling analyses; and 3) incomplete commitments to water quality-related mitigation, adaptive management and monitoring. We have provided recommendations regarding mitigation and have also provided technical comments for your consideration.

## **Water Quality**

The EPA is concerned that the DEIS discloses that the Preferred Alternative could cause exceedances of water quality standards (WQS) for total phosphorus (TP) in Chatfield Reservoir, but does not provide a thorough plan to ensure that those potential impacts will be avoided or mitigated. We are also concerned that the DEIS does not analyze the Preferred Alternative's impacts to impaired water bodies, total maximum daily loads (TMDLs), and permitted dischargers in the South Platte River from the anticipated reduced flow in the segments immediately downstream of Chatfield Reservoir. These segments are on the Clean Water Act (CWA) Section 303(d) list of impaired water bodies and have established TMDLs. An increase in concentrations from reduced flows could cause or contribute to exceedances of the applicable WQS or affect the loading requirements specified in the current TMDLs. The FEIS should identify effective mitigation measures and/or adaptive management actions that will be implemented as part of the Preferred Alternative to either avoid or reduce the impacts and ensure that the project does not cause exceedances of WQS at either Chatfield Reservoir or the South Platte River. The following comments detail our concerns.



### ***Chatfield Reservoir: Potential for Nutrient Standard Exceedances***

The DEIS presents the results of two models to characterize potential nutrient impacts to Chatfield Reservoir from the project, a “local model” and a “regional model.” The models predict inconsistent nutrient impacts as a result of implementation of the Preferred Alternative. The local model predicts exceedances of both the TP water quality standard of 30 µg/L and the associated assessment criterion of 35 µg/L, as depicted in the table below.<sup>1</sup> Conversely, the regional model predicted minimal nutrient changes, and even a slight decrease in chlorophyll concentrations (which can be directly related to TP concentrations).

| <b>Table 1. Local model predicted TP concentrations.</b> |                    |                                |                          |                                      |
|--|--------------------|--------------------------------|--------------------------|--------------------------------------|
|  | <b>Condition</b>   | <b>Modeled Summer TP, µg/L</b> | <b>TP standard, µg/L</b> | <b>TP assessment criterion, µg/L</b> |
| Baseline   | Hypolimnion of 1 m | 35                             | 30                       | 35                                   |
|  | No hypolimnion     | 18                             |                          |                                      |
| Maximum condition (12 ft increase in hypolimnion)        | Short-term         | 71                             |                          |                                      |
|  | Long-term          | 55                             |                          |                                      |
| Average condition (9.3 ft increase in hypolimnion)       | Short-term         | 66                             |                          |                                      |
|  | Long-term          | 50                             |                          |                                      |
| Minimum condition (no hypolimnion)                       | Short-term         | 37                             |                          |                                      |
|  | Long-term          | 20                             |                          |                                      |

#### **Local Model**

The local model is likely to be a better predictor of nutrient conditions, because unlike the regional model, the local model uses Chatfield-specific data to describe nutrient dynamics, considers low oxygen conditions, includes contributions from inundated soil and vegetation, and factors in lake stratification. As such, we do not understand the DEIS’s assertion that the nutrient impacts as predicted by the local model are unlikely and offer recommendations to more fully characterize and clarify potential water quality impairments.

The DEIS states that internal loading (*i.e.* TP releases from reservoir sediments) is not currently a concern in Chatfield Reservoir because of the lack of anoxic conditions (*i.e.* per the DEIS definition of dissolved oxygen (DO) less than 2.0 mg/L) as supported by more than 20 years (1986 to 2007) of water quality monitoring (DEIS pp. 3-19, 4-3, 4-44). However, recent post-2009<sup>2</sup> data show that DO levels

<sup>1</sup> The DEIS did not identify a long-term TP concentration for the minimum (no hypolimnion) condition, but the EPA has used the 0.416 conversion factor to approximate this value from that provided in terms of orthophosphorus in Appendix J.

<sup>2</sup> These data are available at <http://www.chatfieldwatershedauthority.org/reports.html>

regularly go below 2.0 mg/L, which appear more consistent with the local model's predictions of TP concentrations. Anoxic conditions can contribute to internal loading by causing the release of stored phosphorous from reservoir sediments. Additionally, the DEIS does not identify the frequency with which the projected exceedances are predicted to occur. This is important because the TP WQS allows the standard to be exceeded once within any five year period. As a result, it is unclear whether or not the predicted model results represent attainment of the phosphorus WQS.

The EPA has the following recommendations to clarify the analysis of the project's impacts on TP and ammonia-nitrogen:

- Incorporate post 2009 water quality data into the nutrient modeling and/or include this information in the FEIS discussion and disclose any potential implications associated with internal loading and the TP water quality standard;
- Include a discussion of any reservoir operations/management changes since 2009 that could have led to the recent anoxic conditions;
- Present the recent development of anoxic conditions in the "Trends" section of Appendix J;
- Clarify whether the baseline TP conditions presented in the DEIS are modeled, and if this is the case, include the averages of recent July-September TP observed data (*i.e.* 2007-2011) in the FEIS to give a sense of the model's predictive capabilities and assist in characterizing the baseline;
- Characterize expected frequency of the predicted model results in order to better understand how often concentrations will be higher than the TP standard; and
- Explain why the local model's predicted nutrient concentrations are described as instantaneous maxima (Appendix J, pp. 35, 37, 41, 44). This appears to be inconsistent with the data and steady state approach used to develop the model and is not typically used to assess nutrient concentrations.

## Regional Model

The regional model, EUTROMOD, used data and assumptions that may not accurately reflect conditions at Chatfield Reservoir. EUTROMOD used TP data and pre-2001 depth data, but did not include observed 2001-2007 data. EUTROMOD also used assumptions from the Midwest related to nutrients and chlorophyll dynamics which reflect different climatic and seasonal conditions and may not accurately reflect reservoir and nutrient dynamics in Colorado's Front Range.

EUTROMOD did not use actual depth data for the years 2001 to 2007, but assumed the mean of the 1942 to 2000 depth data as a substitution. The substitution has important implications, because it is used to calculate hydraulic residence time (HRT). HRT is a very large, if not primary, driver of the model, because the key eutrophication parameters are sensitive to the HRT. Based on the EUTROMOD results, the DEIS concludes that goals for addressing potential water quality issues could be achieved with proper management of the volumes and outflow for the reservoir. However, the DEIS also indicates that, under the Preferred Alternative, operating the reservoir to control flows may not be implementable given the timing and objectives of water uses (p. 4-44).



Regarding the EUTROMOD presentation within the FEIS, the EPA has the following suggestions:

- Incorporate post-2001 depth data and rerun the model or run EUTROMOD without the 2001-2007 substituted depth data to illustrate what influence the depth data substitution has on model output; and
- Discuss how the assumptions from the Midwest may deviate from conditions in this region and relate those differences to the model predictions.

#### ***Chatfield Reservoir: TMAL***

The total maximum annual load (TMAL) for nutrients (19,600 lbs TP at a median inflow of 100,860 AF) for Chatfield Reservoir was developed pursuant to the CWA to protect Chatfield Reservoir against increasing eutrophication and exceedances of standards for total phosphorus (30 µg/L) and chlorophyll *a* (10 µg/L). If the Project causes an increase in internal loading, as predicted by the local model, revision to the TMAL (such as load and wasteload allocations) may be necessary.

- The EPA recommends that the FEIS describe whether this project has a potential impact that will trigger a need to revise the TMAL.

#### ***South Platte River: Water Quality Impairments, TMDLs, & Dischargers***

The DEIS does not analyze how decreased outflows from Chatfield Reservoir into the South Platte River from the Project may affect existing water quality impairments, TMDL loads, or permitted dischargers. Flow reduction may decrease the South Platte's assimilative capacity. The EPA is concerned that an increase in concentrations could exacerbate existing impairments or necessitate a change to the loading requirements specified in TMDLs.

Two segments of the South Platte downstream of Chatfield Reservoir are identified on Colorado's list of impaired waterbodies for *Escherichia coli* (*E. coli*) and arsenic pursuant to Section 303(d) of the CWA. Four TMDLs for *E. coli*, nitrate, DO, and cadmium have also been completed for these segments. The DEIS concludes that the Project will have no effect on *E. coli* concentrations or the TMDL for *E. coli* because it is not a source of *E. coli* (p. 4-45). This conclusion should be further supported and explained because flow reductions from the Project could reduce the quantity of relatively low pollutant water available for dilution of *E. coli* or other pollutants for which water quality impairments or TMDLs exist.

While the DEIS acknowledges that monthly flow reductions up to an estimated 7% (based on Figure 4-12, p. 4-51) are projected at the Denver gage approximately 15 miles downstream of the dam and also downstream of the confluence with a major tributary (Cherry Creek), potential effects on the river segment immediately downstream of the reservoir are not presented.

The EPA has the following recommendations for the FEIS to strengthen the analysis of impacts to the South Platte River and address the concerns noted above:

- Discuss when and where the Project will affect downstream flows and whether it is expected to lead to an increase in pollutant concentration through a reduction of flow. It is important to consider flows on a fine enough scale to detect changes (such as monthly) and across a range of flow conditions (dry, wet, average). If the hydrologic model cannot predict flows in the reach from Chatfield Reservoir to the Denver Gage, outflows from Chatfield may be surrogates;



- Assess whether flows are affected at the locations where water quality impairments, TMDLs, or permitted dischargers occur. If these flows are affected, discuss potential impacts on these impaired water body segments and the TMDLs; and
- Identify permitted dischargers downstream of Chatfield Reservoir where permits may be affected due to changes in flow conditions.

## **Mitigation, Adaptive Management, and Monitoring**

### **Water Quality**

The EPA acknowledges that Chatfield is a complex and variable system, and there is associated uncertainty with respect to the relationships between and among nutrient dynamics, water availability and reservoir operations. This uncertainty emphasizes the importance of the commitment to a thorough adaptive management plan, with mitigation measures and monitoring to assure that nutrient levels are maintained to achieve the WQS. Although the DEIS states that the Providers and the Corps intend to create and implement a strong adaptive management strategy involving active monitoring and mitigation adjustments based on “actual conditions,” these details are not included in the DEIS.

The EPA is concerned that potential nutrient impacts are not addressed as part of the Compensatory Mitigation Plan (CMP). Inclusion of nutrient impacts is critical so that these impacts are provided the same consideration as other impacts.

With respect to water quality, Table 4-1 identifies three “required adaptive management” activities to address potential impacts and uncertainty: 1) removal of terrestrial vegetation prior to inundation, 2) aeration/mixing of the reservoir to limit stratification and anaerobic conditions, and 3) altered management of inflows and outflows to manage flushing and HRT. While each of these activities has the potential to mitigate impacts to DO and nutrients, their ability to fully offset these impacts is uncertain due to the lack of details offered in the DEIS. Flow management most directly addresses what appears to be the root cause of the predicted long-term nutrient and DO issues in Chatfield, given the influence of HRT and outflows on both the regional and local nutrient models.

We recommend the FEIS include mitigation commitments for water quality as part of the CMP, and similar to the CMP’s “target environmental resources,” include milestones and success criteria necessary to prevent nutrient impacts and potential WQS exceedances. Detailed plans and specifications for the mitigation activities should be prepared and included within the Record of Decision (ROD). The EPA suggests the following information be included in the plan:

### **Mitigation and Adaptive Management Recommendations**

- A discussion of additional mitigation measures to address nutrient impacts, including:
  - mitigation measures that involve cooperative efforts and support for on-going (and potentially additional) nutrient reduction projects in the watershed;
  - ongoing mitigation, adaptive management or other management activities in Chatfield Reservoir targeting protection from nutrient impairment;
  - reservoir operation and management opportunities that could reduce impacts from nutrients. We recommend the FEIS include additional details regarding operating scenarios, including both a discussion of any limitations and the potential opportunities for overcoming them to avoid water quality impacts. It would be important to identify

any potential indirect environmental impacts elsewhere in the system associated with such scenarios;

- non-operational opportunities to reduce external and internal nutrient loading through point source, nonpoint source, and/or TMAI controls; and
- Identification of thresholds associated with eutrophication, including DO, nutrients, and chlorophyll levels that would trigger management actions early to ensure their implementation will protect water quality standards.

#### Monitoring Recommendation

- A description of any ongoing monitoring activities and a commitment to any additional monitoring necessary to characterize and establish pre-project baseline conditions for DO, nutrients, and chlorophyll to assure long-term protection against nutrient-related impairment.

#### General Recommendations for Mitigation

In addition to the water quality mitigation recommendations outlined above, we recommend further description of a number of the mitigation provisions/agreements described in the DEIS. In order to ensure effective development and implementation of the overall mitigation for the Preferred Alternative, we suggest these elements of mitigation be described and included in the CMP. Specific references in the DEIS are provided below along with recommendations:

- Include details of the adaptive management approach and the Coordinated Reservoir Operations Plan provisions to be developed to protect the walleye brood stock program (page 4-56);
- Include mitigation measures (to be developed in coordination with CDOW) to fund stream habitat improvements in the South Platte River upstream and downstream from Chatfield Reservoir (page 4-56);
- Consider mitigation provisions to address the potential aquatic life impacts of flow changes to the South Platte River downstream of Chatfield Reservoir. The Draft Ecosystem Restoration Evaluation Report (Great Western Institute et al., 2007; Appendix D) evaluated opportunities to protect and enhance fishery habitat through management of future water releases. The study found that alternative release patterns from the reallocated storage to address base flow conditions during the winter months (a critical aquatic stressor) can dramatically improve conditions; and
- Consider increasing the compensation for loss of mature cottonwoods above the proposed 1:1 acreage. In EPA's experience across the country and in the scientific supporting literature, offsetting functional loss has a time lag and is not always successful: restoration efforts often face a high failure rate. These lessons seem particularly pertinent to replacing mature (30+ year old) cottonwoods. Enhanced mitigation recommendations for this type of resource generally include a replacement ratio in the range 1:5 to 1:15.

Given the critical role of the CMP and the implementation details, including monitoring and adaptive management, the EPA is interested in participating in the process through representation on the Technical Advisory Committee.



## **Other Considerations**

### ***Climate Change***

The DEIS does not include a discussion of the potential impacts of climate change on the Project, and concludes that climate variability cannot be accurately predicted at this time. However, information is available that should be included in the FEIS to ensure disclosure of possible impacts. The EPA recommends that the FEIS reference relevant local research on potential climate change impacts, such as the Joint Front Range Climate Change Vulnerability Study, which combines the results of the latest climate science with available hydrologic simulation capabilities to better understand future streamflow trends. Regional research projects that air temperatures will warm, leading to earlier and slightly reduced runoff. We suggest that the FEIS consider and discuss what impact an increase in temperature and/or decrease in flows would have on the Project, especially in relationship to how changes in hydrology could affect reservoir operations and project objectives. The EPA recommends review of the Arkansas Valley Conduit Draft Environmental Impact Statement, which is available online at [www.usbr.gov/avceis](http://www.usbr.gov/avceis). In this DEIS, various runoff projections representing different climate change scenarios were converted to streamflow and, in part, used to investigate the ability to meet water demands in the future.

### ***Chatfield Reservoir: E. coli.***

The *E. coli* water quality standard of 126 colonies/100 mL is a two-month geometric mean. Section 5 of Appendix J presents monthly maximum data and compares them to the water quality standard. While these monthly data are useful information, they are not the correct basis for comparison to the standard. We suggest using two-month geometric means of *E. coli* for comparison to the water quality standard of 126 colonies/100 mL.

### ***Conclusion***

Based on our review, and in accordance with the enclosed rating criteria, the EPA has rated the DEIS as "Environmental Concerns – Insufficient Information" ("EC-2"). The EC rating indicates that the EPA's review has identified potential water quality impacts to Chatfield Reservoir and the South Platte River that should be avoided in order to adequately protect the environment. Corrective measures may require changes to the Preferred Alternative or application of mitigation measures that can reduce the environmental impact. We also recommend additional analysis and information to fully assess and mitigate all potential impacts of the management actions. The EPA is committed to working with you in the coming months to better characterize the nutrient and flow-related issues, and identify potential measures to avoid, minimize or reduce impacts, before issuance of the FEIS and the ROD.



We appreciate the opportunity to participate in the review of this project. If we may provide further explanation of our comments during this stage of your planning process, please contact me at 303-312-6925, or your staff may contact Melanie Wasco, Lead NEPA Reviewer, at 303-312-6540.

Sincerely,



Suzanne J. Bohan  
Director, NEPA Compliance and Review Program  
Office of Ecosystems Protection and Remediation

Enclosure: Ratings Criteria

